IDO-IPC8815-V1 Linux软件使用手册

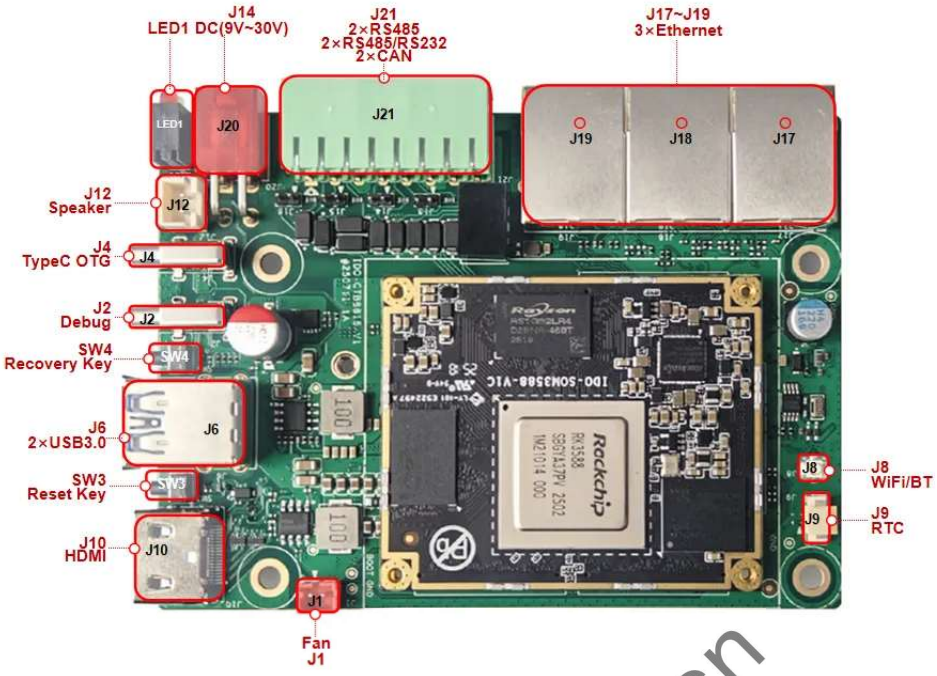
Industio 触觉智能

IDO-IPC8815-V1

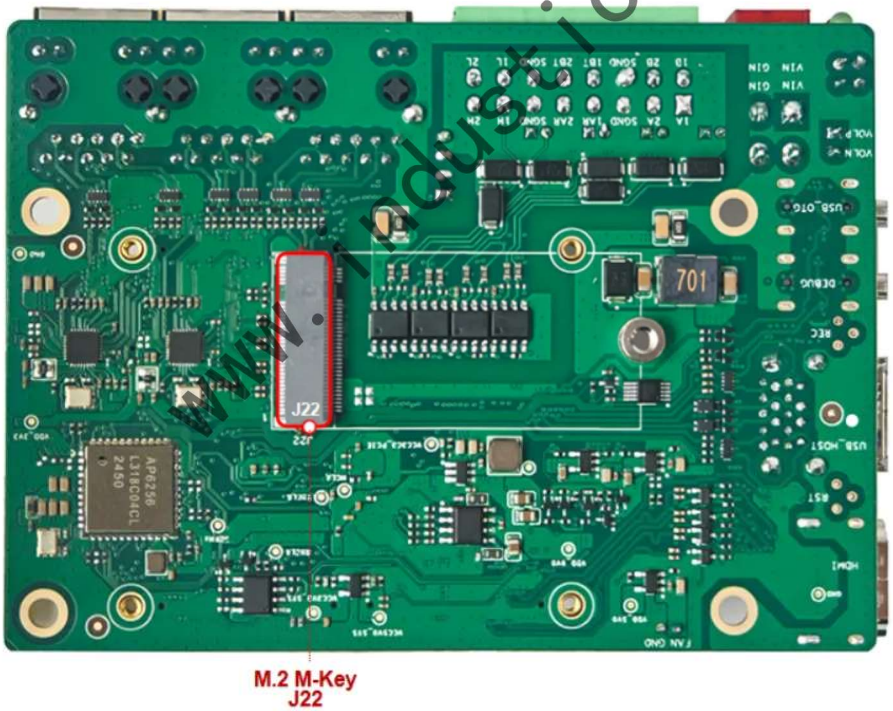
Linux软件使用手册

1. 硬件资源概况

1.1. 主板照片



IDO-CTB8815-V1 正面实物图



1.2. 硬件资源

序号	名称	描述
1	内核版本	Linux 6.1

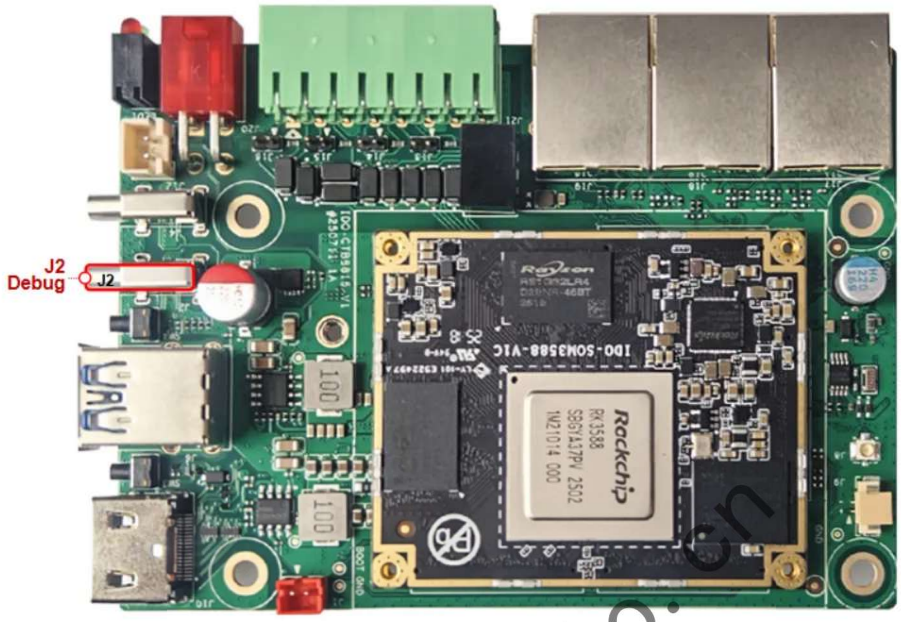
2	系统版本	DEBIAN12，UBUNTU20/22
3	内存	8GB LPDDR4
4	存储	64GB eMMC
5	供电	DC接口12V@2A
6	显示	HDMI2.1（支持4K@60fps 输出）
7	以太网	千兆以太网 ×3
8	调试串口	TTL ×1
9	按键	RECOVERY ×1 RESET ×1
10	扬声器	PH2.0-2P(4Q10W) ×1
11	WIFI/BT	AP6256 ×1
12	USB OTG	USB OTG Type-C x1（烧录口）
13	USB HOST	USB3.0 HOST x2
14	PCIe	PCIe2.1 NVME硬盘 ×1
15	UART	RS232 ×2 RS485 ×2
16	WIFI/BT	AP6256 ×1
17	CAN	CAN ×2
18	RTC	HYM8563 ×1
19	LED	2 × 指示灯（电源指示灯+系统指示灯）
20	Fan	5V PH2.0-2P ×1

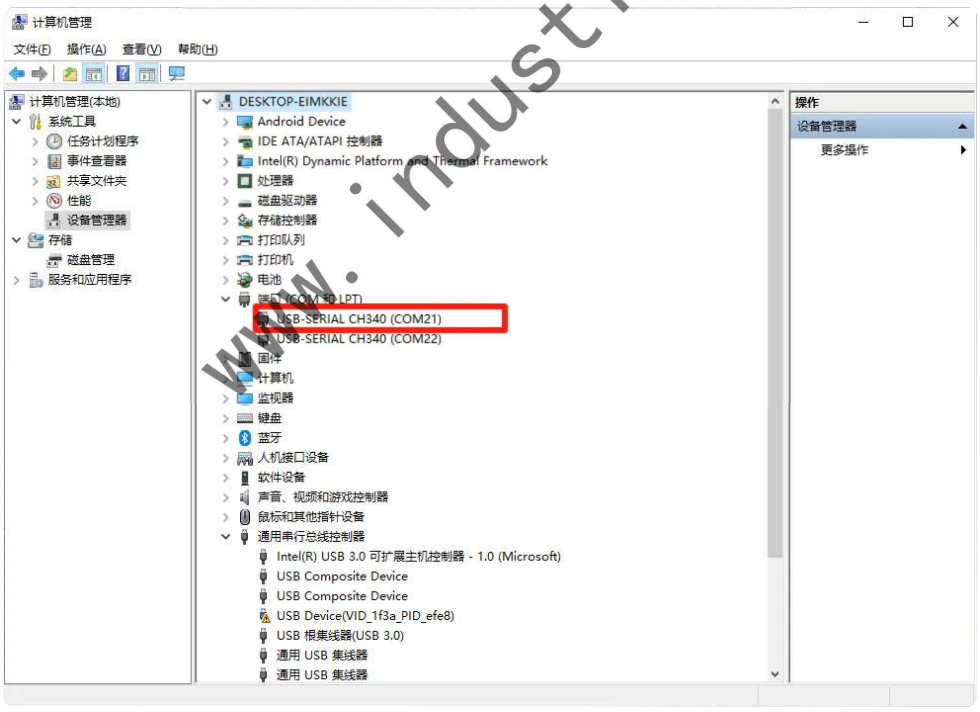
2. Ubuntu22.04接口使用方法

2.1. 登录

2.1.1. 串口

准备一根type-C数据线，接入电脑，串口波特率设置为1500000

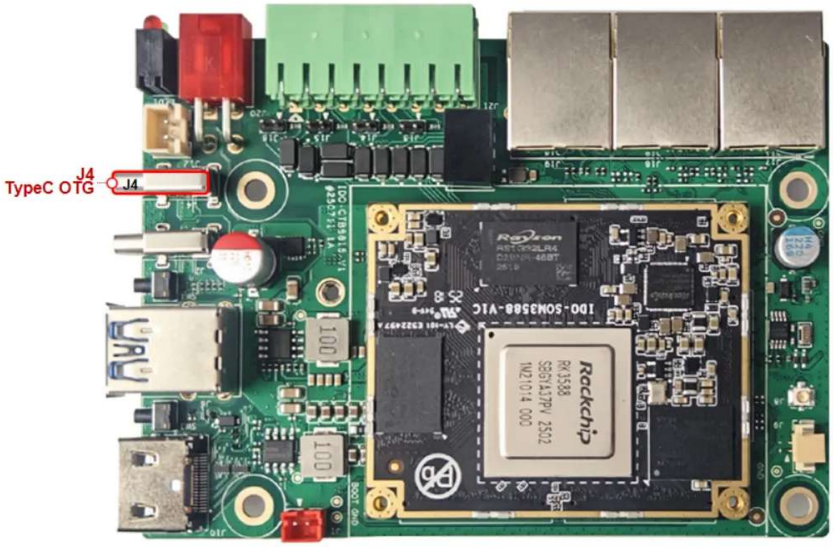


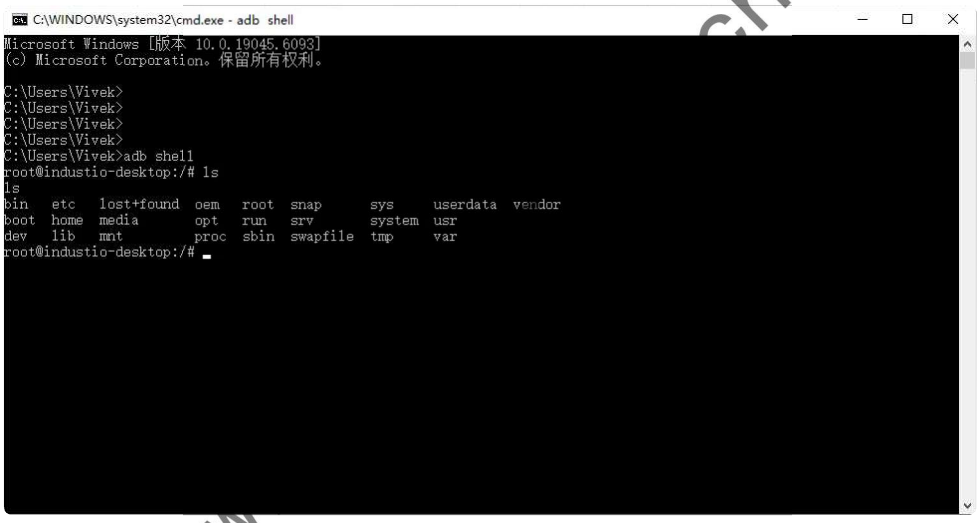


账号密码：industio/123456

2.1.2. adb

准备一根type-C数据线，一端接入电脑



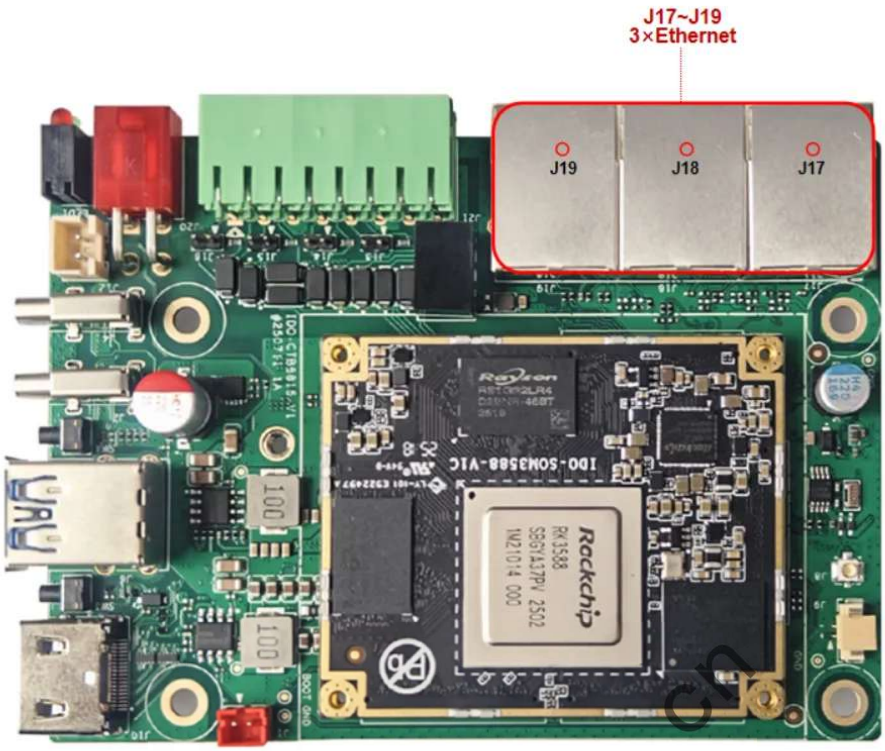


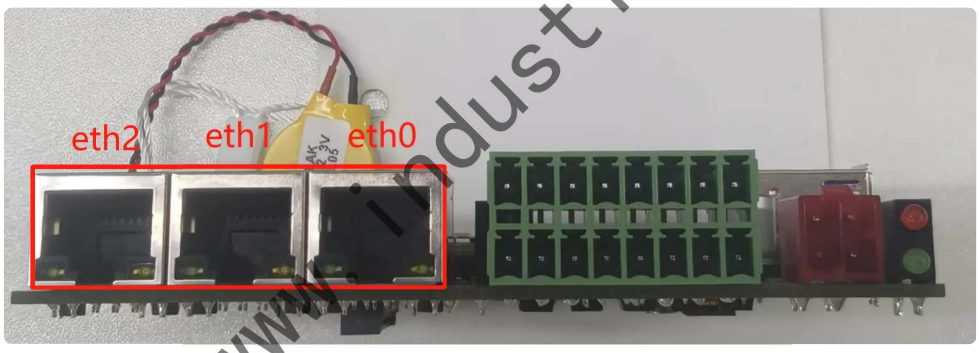
2.1.3. ssh

ssh industio@ipaddress

密码：123456

2.2. 以太网



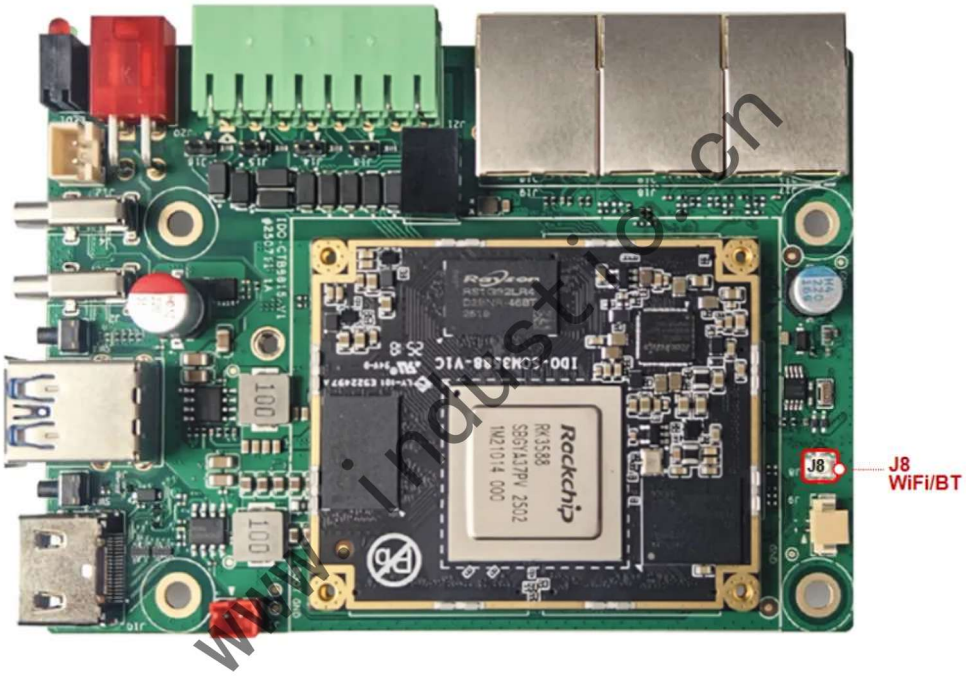


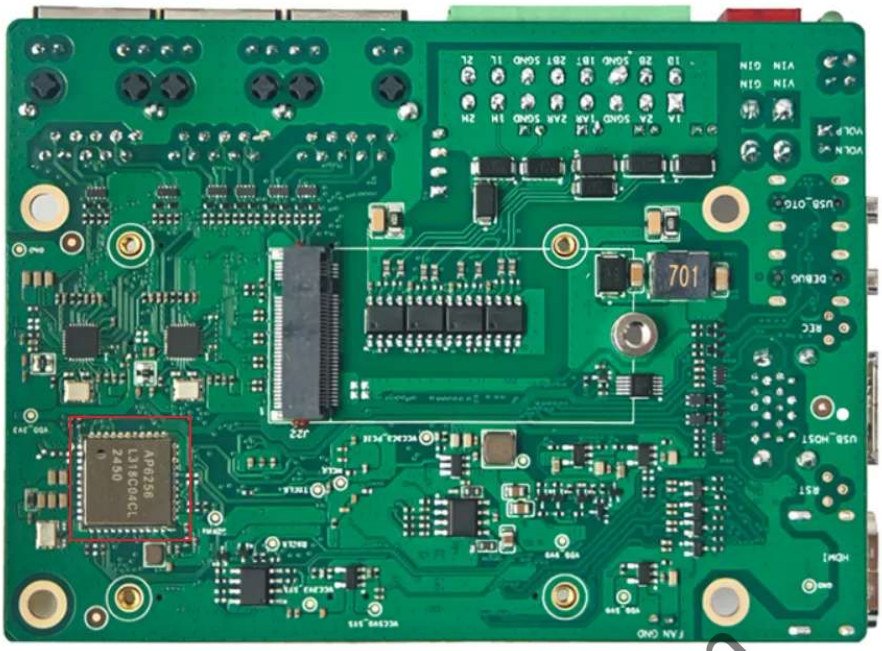
Bash

```
# ifconfig
docker0   Link encap:Ethernet  HWaddr 02:42:01:8d:d8:8a
          inet addr:172.17.0.1  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 TX bytes:0

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope: Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:240 errors:0 dropped:0 overruns:0 frame:0
          TX packets:240 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:22080 TX bytes:22080

eth0      Link encap:Ethernet  HWaddr 0a:dc:b0:80:a4:4b  Driver rk_gmac-dw
mac
          inet6 addr: fe80::8dc:b0ff:fe80:a44b/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:5 errors:0 dropped:0 overruns:0 frame:0
          TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:362 TX bytes:1004
          Interrupt:71

eth1      Link encap:Ethernet  HWaddr 0e:e4:0f:db:34:72  Driver yt6801
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:2167 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2141 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:304107 TX bytes:2548456
          Interrupt:117 Base address:0x8000

eth2      Link encap:Ethernet  HWaddr 5a:a3:67:6a:96:8c  Driver yt6801
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:91 errors:0 dropped:0 overruns:0 frame:0
          TX packets:72 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:19493 TX bytes:15717
          Interrupt:127 Base address:0x4000


```

```
wlan0     Link encap:Ethernet  HWaddr 9c:b8:b4:9a:73:18  Driver bcmsdh_sdm
mc

          inet6 addr: fe80::9eb8:b4ff:fe9a:7318/64 Scope: Link
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 TX bytes:796
```

2.3. WIFIBT





2.3.1. wifi

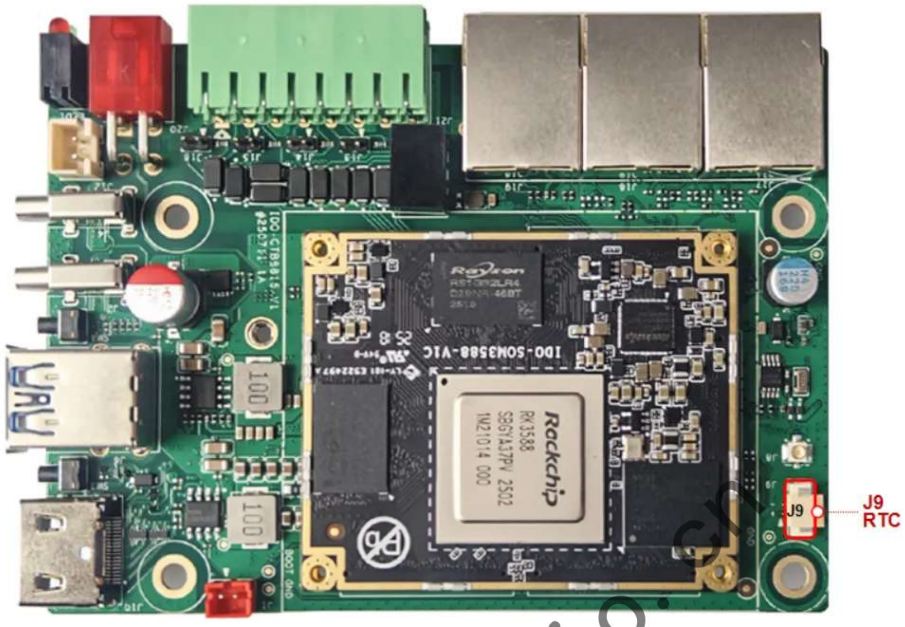
```Bash
root@industio-desktop:/# nmcli dev wifi list    #查询wifi列表
root@industio-desktop:/# nmcli dev wifi connect 账号 password 密码 ifname wlan0     #连接热点

root@industio-desktop:/# nmcli connection show
```

2.3.2. 蓝牙

```Bash
root@industio-desktop:/# bluetoothctl
[bluetooth]# bluetoothctl
[bluetooth]# power on
[bluetooth]# scan on
[bluetooth]# devices                        #查看蓝牙设备
[bluetooth]# trust AC:C4:BD:6C:F2:10    #信任设备
[bluetooth]# pair AC:C4:BD:6C:F2:10     #配对
[bluetooth]# connect AC:C4:BD:6C:F2:10  #连接
```

2.4. RTC

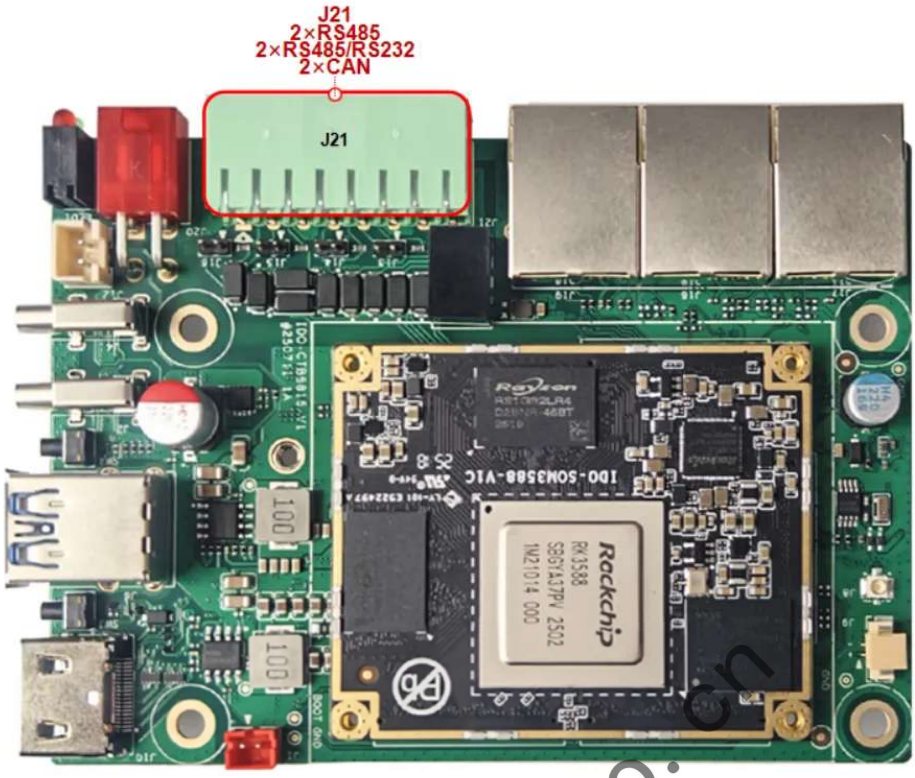
图中标注电池位置

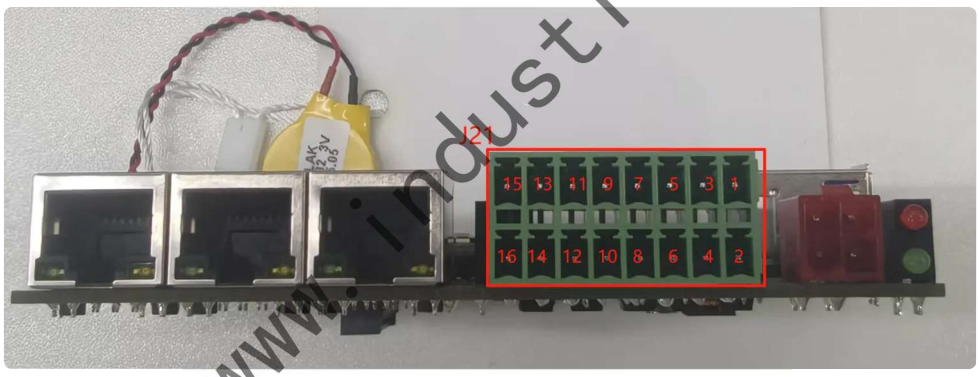


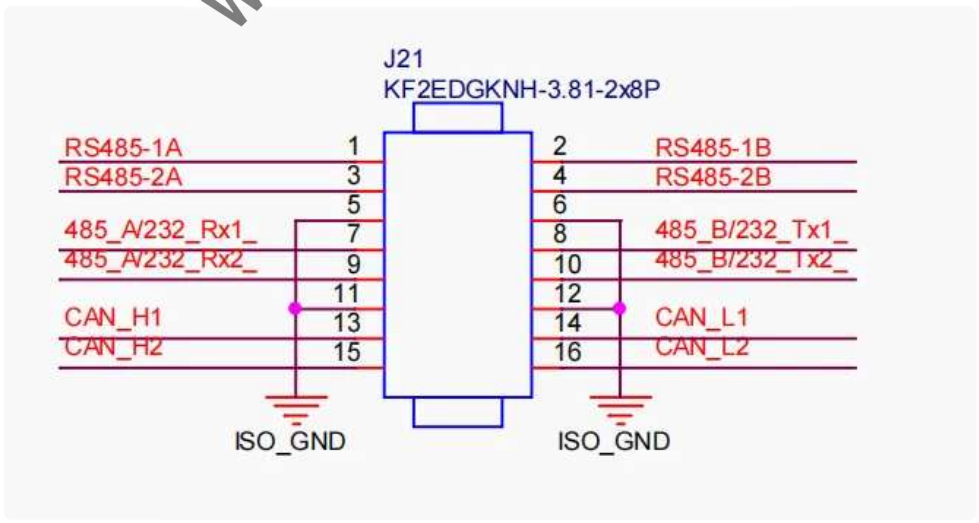
Bash

```
root@industio-desktop:~# date -s "2025-10-17 18:34:10"
root@industio-desktop:~# hwclock -w #同步时间到RTC

root@industio-desktop:~# hwclock -r
```


2.5. RS485/RS232







RS485-1		RS485-2

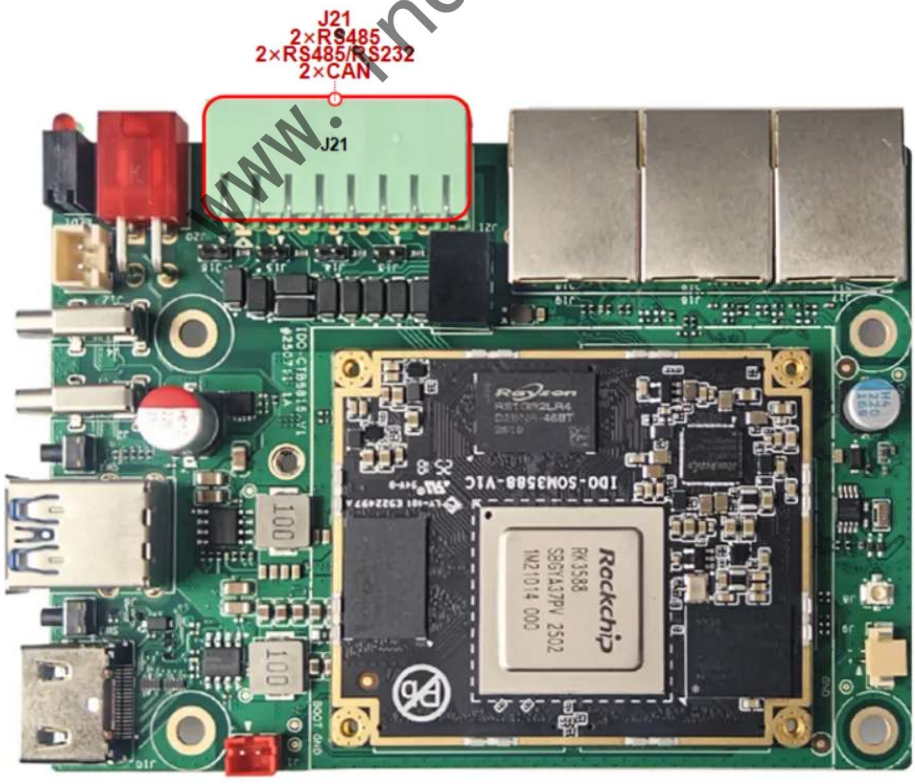
/dev/ttyS1	<---->	/dev/ttyS6
J21–1	<---->	J21–3
J21–2	<---->	J21–4

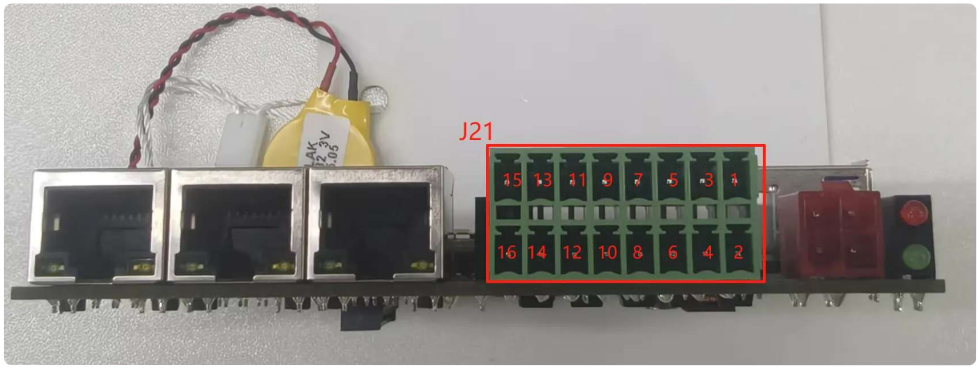
R232–1		RS232–2
/dev/ttyS3	<---->	/dev/ttyS8
J21–7	<---->	J21–10
J21–8	<---->	J21–9

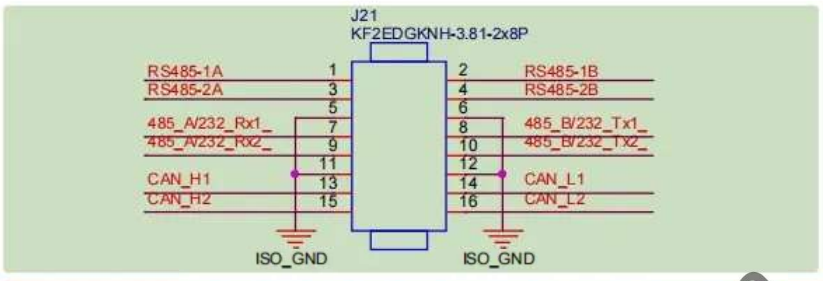
Bash

```
1  microcom -s 115200 -p /dev/ttyS1
```


2.6. CAN





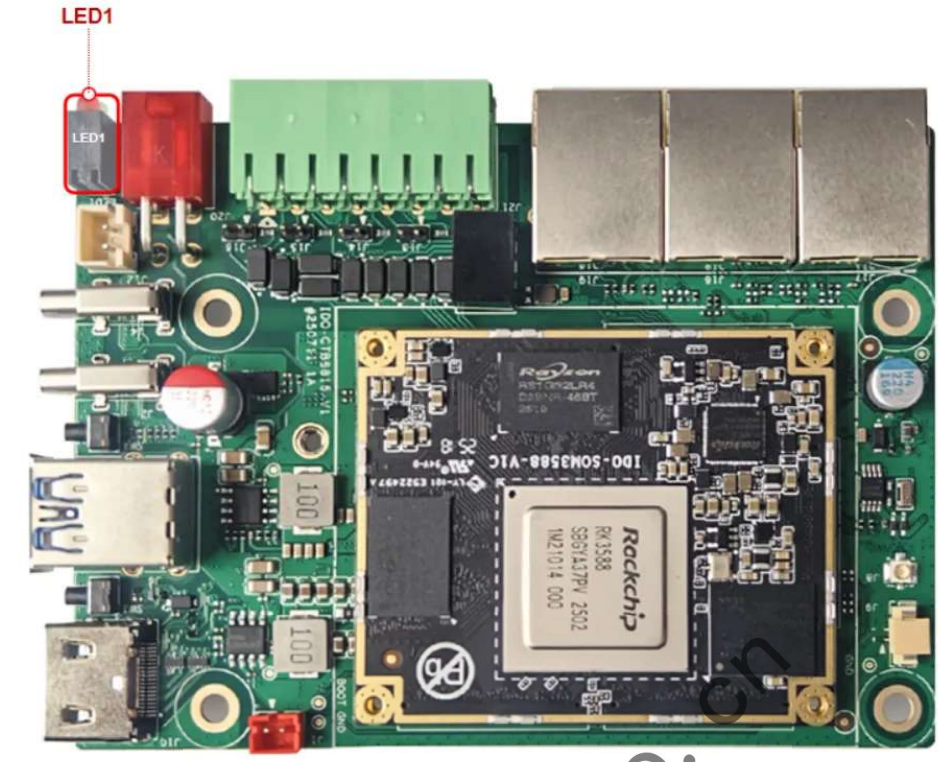


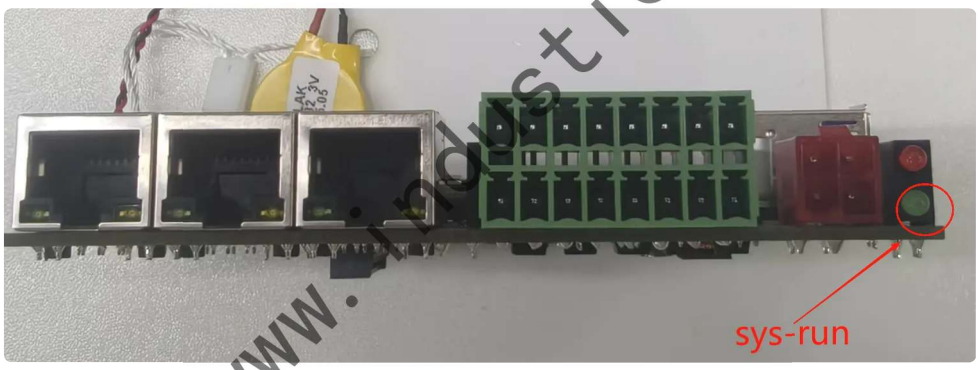
CAN0		CAN1
J21-13	<---->	J21-15
J21-14	<---->	J21-16

Bash

```
ip link set can0 type can bitrate 1000000
ip link set can0 up
ip link set can1 type can bitrate 1000000
ip link set can1 up

candump can0&                   #等待接收
cansend can1 123#DEADBEEF       #发送
```


2.7. Watchdog



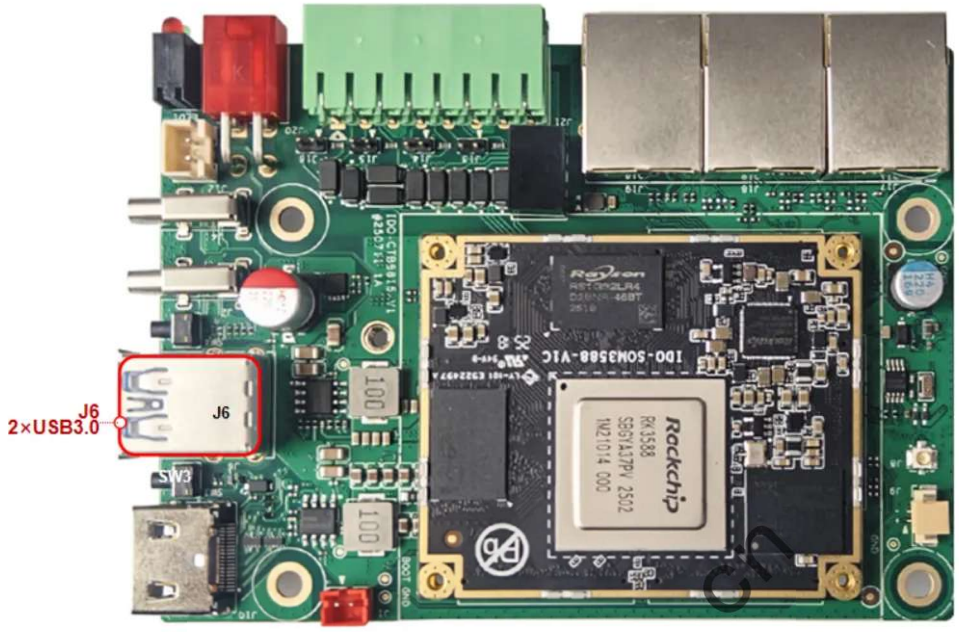


开机后进入系统后，绿灯闪烁。

测试 Bash

```
#测试需要拔掉烧录线 等待5分钟自动重启
# cat /sys/class/leds/sys-led/trigger
none rfkill-any rfkill-none kbd-scrolllock kbd-numlock kbd-capslock kbd-kanalock kbd-shiftlock kbd-altgrlock kbd-ctrllock kbd-altlock kbd-shiftllock kbd-shiftrlock kbd-ctrlllock kbd-ctrlrlock mmc2 timer [heartbeat] backlight default-on mmc0 rfkill0 rfkill1 rfkill2 rfkill3

# echo none > /sys/class/leds/sys-led/trigger
```

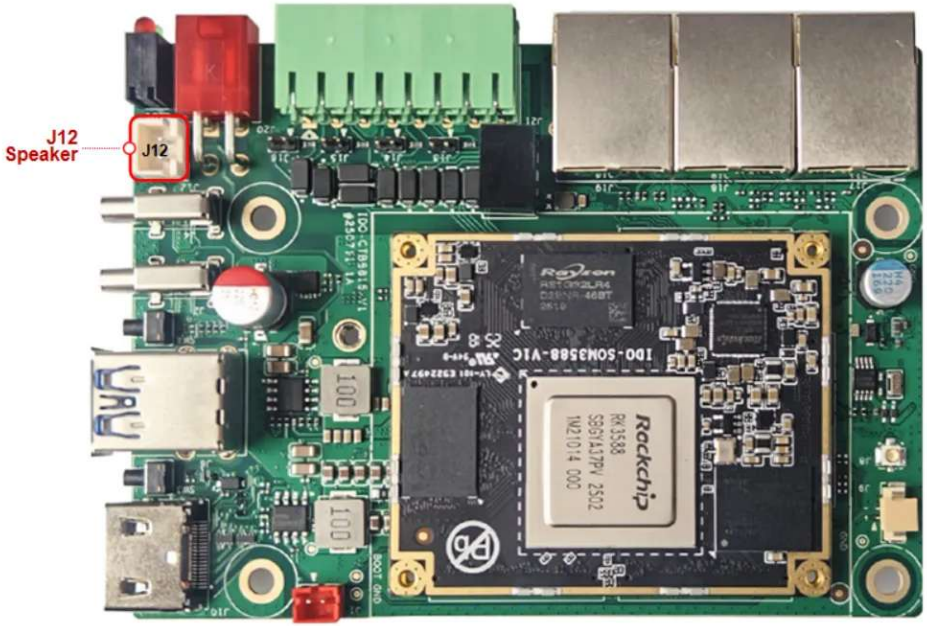
2.8. USB3.0



Bash

```
root@ido:/# df -h
文件系统        容量  已用  可用 已用% 挂载点
/dev/root       114G  8.8G  105G    8% /
devtmpfs        3.9G     0  3.9G    0% /dev
tmpfs           3.9G     0  3.9G    0% /dev/shm
tmpfs           792M  4.0M  788M    1% /run
tmpfs           5.0M  4.0K  5.0M    1% /run/lock
tmpfs           3.9G     0  3.9G    0% /sys/fs/cgroup
tmpfs           3.9G  8.0K  3.9G    1% /tmp
/dev/mmcblk0p6  2.0G  292K  2.0G    1% /userdata
/dev/mmcblk0p7  124M   12M  112M   10% /oem
tmpfs           792M   24K  792M    1% /run/user/1000
/dev/sda1        30G  3.3M   30G    1% /media/industio/TU100
```

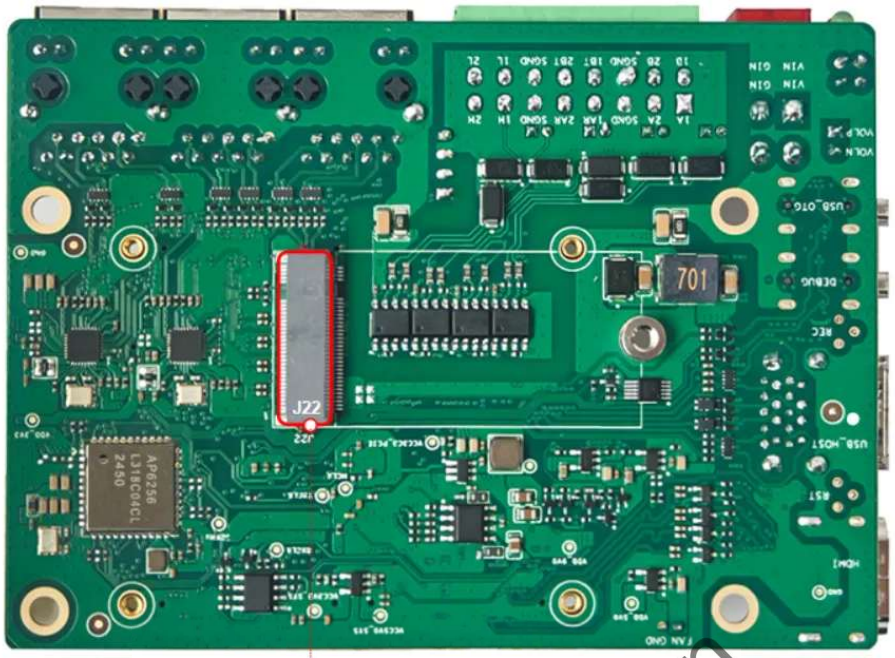

2.9. 声卡




```
industio@industio-desktop:~$ cat /proc/asound/cards
 0 [rockchiphdmi0  ]: rockchip-hdmi0 - rockchip-hdmi0
                      rockchip-hdmi0
 1 [rockchipes8388 ]: rockchip-es8388 - rockchip-es8388
                      rockchip-es8388

#声卡
industio@industio-desktop:~$ aplay -D hw:1,0 One_Last_Time.wav

#HDMI
industio@industio-desktop:~$ aplay -D hw:0,0 One_Last_Time.wav
```


2.10. PCIE

使用m.2固态硬盘测试

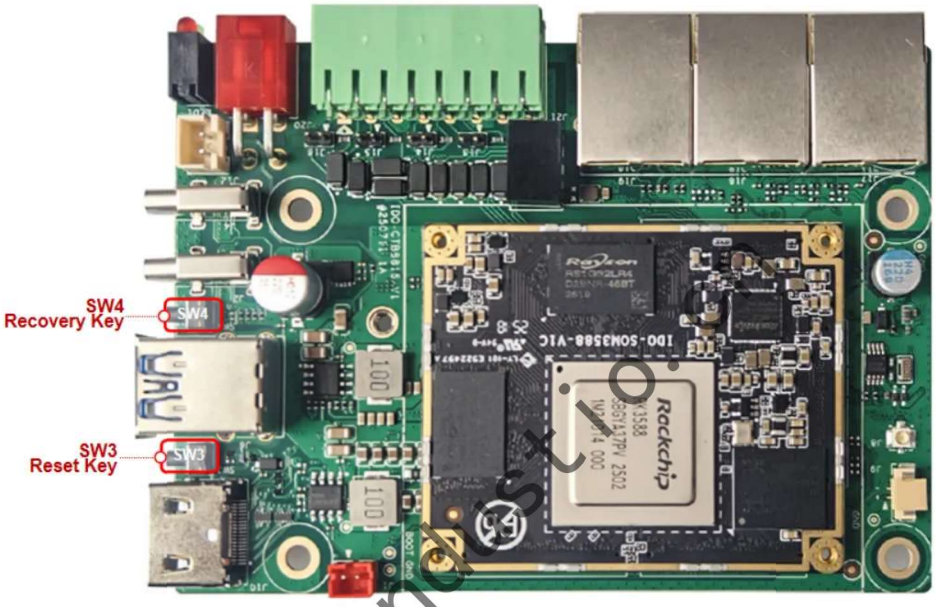


M.2 M-Key
J22

```
root@industio-desktop:/home/industio# fdisk -l
Disk /dev/ram0: 4 MiB, 4194304 bytes, 8192 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes


Disk /dev/mmcblk0: 116.48 GiB, 125074145280 bytes, 244285440 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 6D3A0000-0000-4733-8000-3DFD00006CE3

Device           Start       End   Sectors   Size Type
/dev/mmcblk0p1   16384     24575      8192     4M unknown
/dev/mmcblk0p2   24576     32767      8192     4M unknown
/dev/mmcblk0p3   32768    163839    131072    64M unknown
/dev/mmcblk0p4  163840    425983    262144   128M unknown
/dev/mmcblk0p5  425984    491519     65536    32M unknown
/dev/mmcblk0p6  491520   1540095   1048576   512M unknown
/dev/mmcblk0p7 1540096   1802239    262144   128M unknown
/dev/mmcblk0p8 1802240 244285406 242483167 115.6G unknown


Disk /dev/nvme0n1: 119.24 GiB, 128035676160 bytes, 250069680 sectors
Disk model: Colorful CN600 128GB
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x92cdbbb5

Device         Boot Start       End   Sectors   Size Id Type
/dev/nvme0n1p1        63 250069679 250069617 119.2G  7 HPFS/NTFS/exFAT

root@ido:/# df -h
文件系统        容量  已用  可用 已用% 挂载点
/dev/root       114G  8.8G  105G    8% /
devtmpfs        3.9G     0  3.9G    0% /dev
tmpfs           3.9G     0  3.9G    0% /dev/shm
tmpfs           792M  4.0M  788M    1% /run
tmpfs           5.0M  4.0K  5.0M    1% /run/lock
tmpfs           3.9G     0  3.9G    0% /sys/fs/cgroup
tmpfs           3.9G  8.0K  3.9G    1% /tmp
```

```
/dev/mmcblk0p6  2.0G  292K  2.0G    1% /userdata
/dev/mmcblk0p7  124M   12M  112M   10% /oem
tmpfs           792M   24K  792M    1% /run/user/1000
/dev/nvme0n1p1 125034808 29531856  95502952  24% /mnt/m2
```

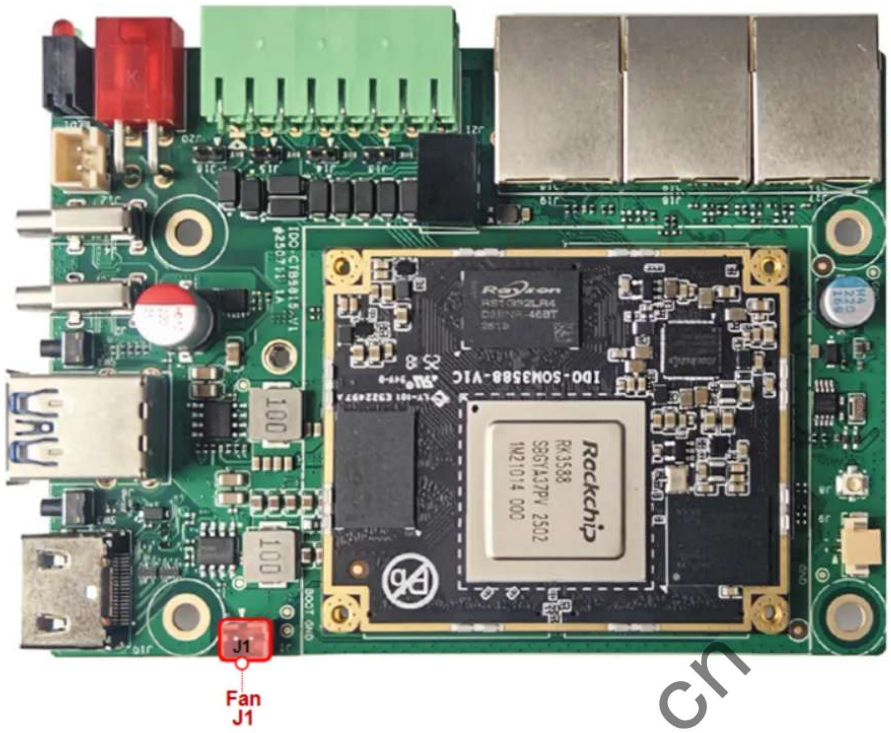
2.11. 按键



SW3：复位按键，按下松开，系统重启。

SW3	RESET
SW4	RECOVERY

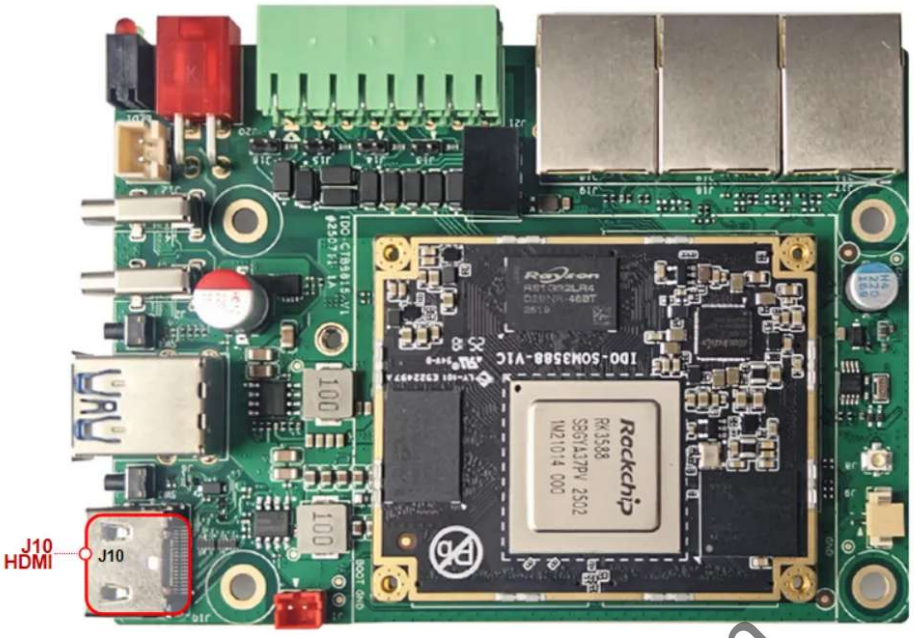
2.12. FAN




```bash
##打开风扇
echo 1 > /sys/class/leds/fan-pwr/brightness
##关闭风扇
echo 0 > /sys/class/leds/fan-pwr/brightness
```


2.13. 显示

2.13.1. HDMI

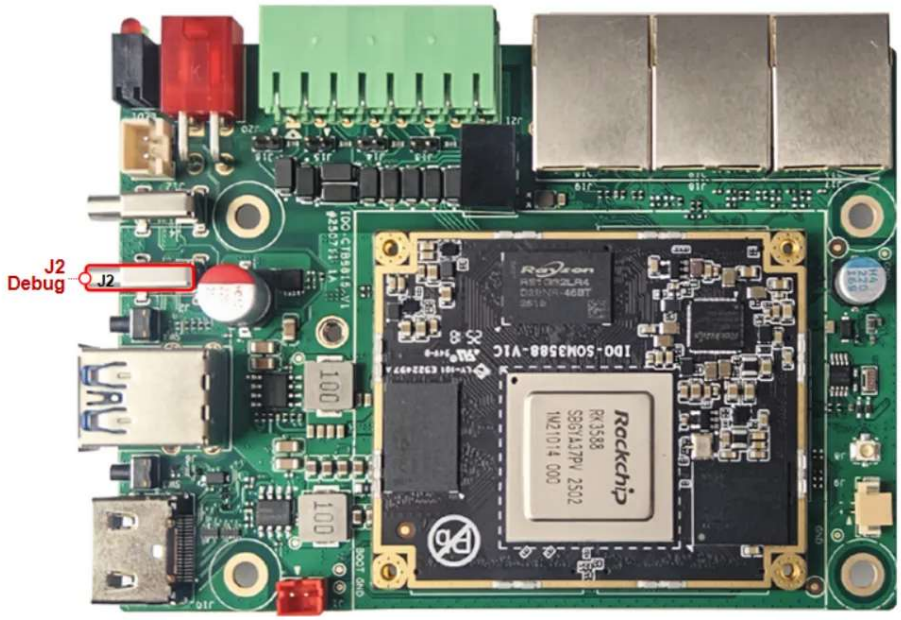


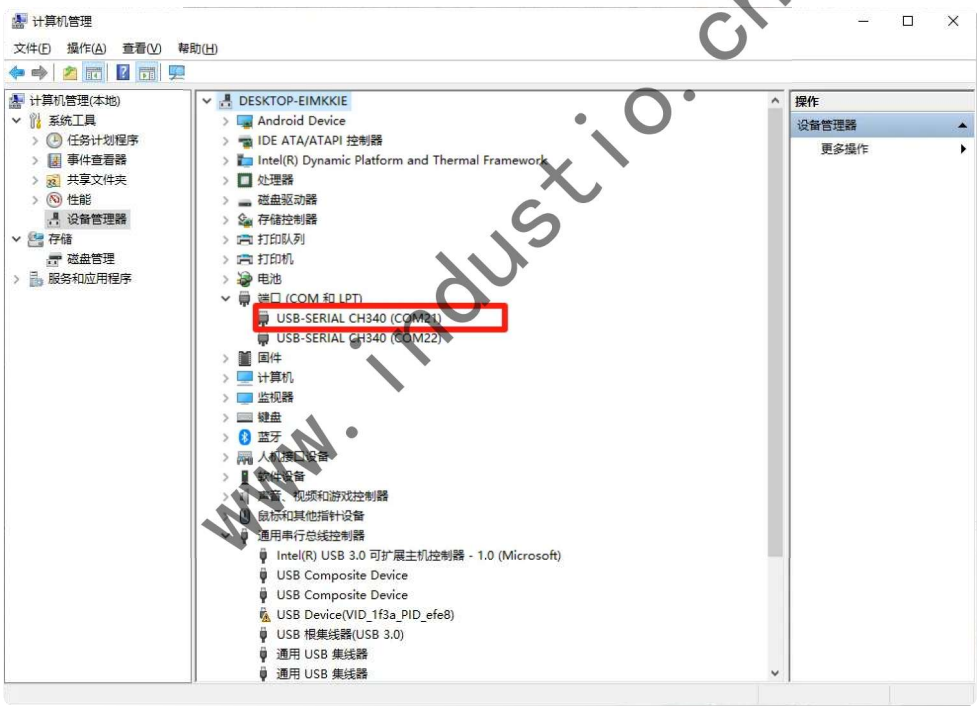
3. DEBIAN12接口使用方法

3.1. 登录

3.1.1. 串口

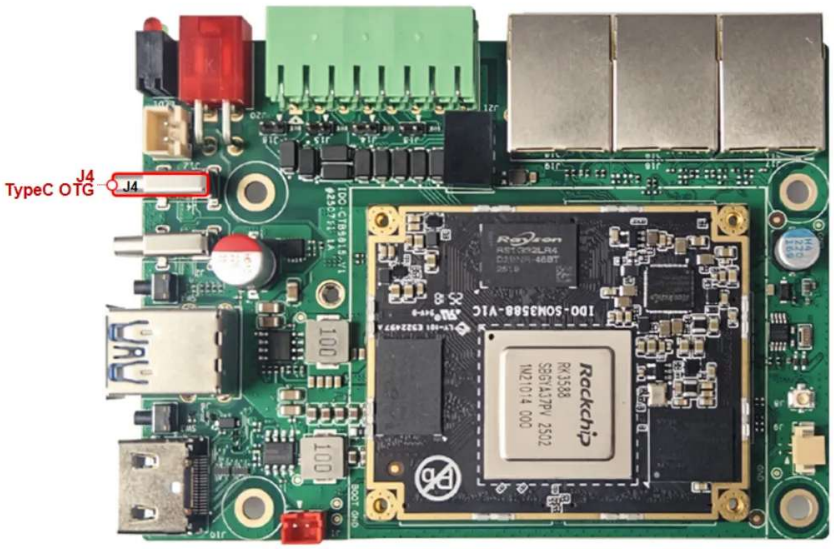
准备一根type-C数据线，接入电脑，串口波特率设置为1500000

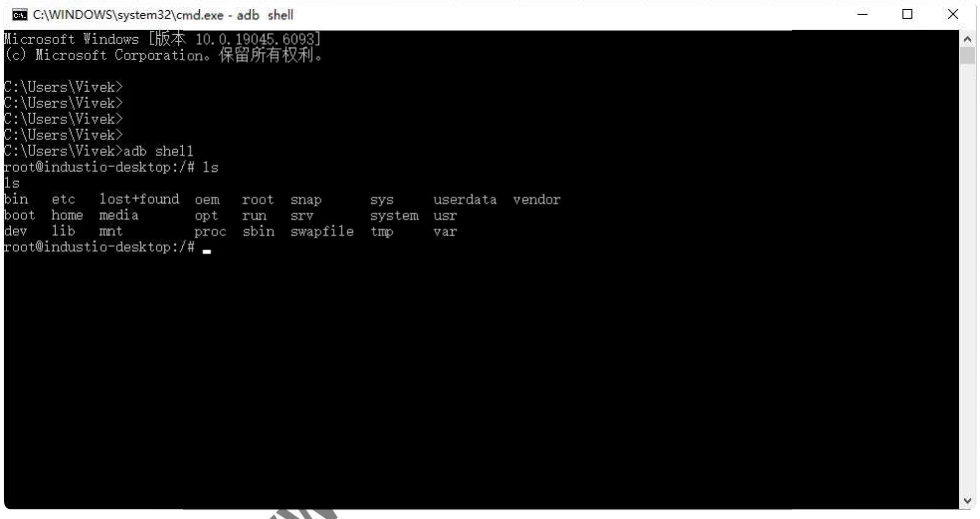




3.1.2. adb

准备一根type-C数据线，一端接入电脑



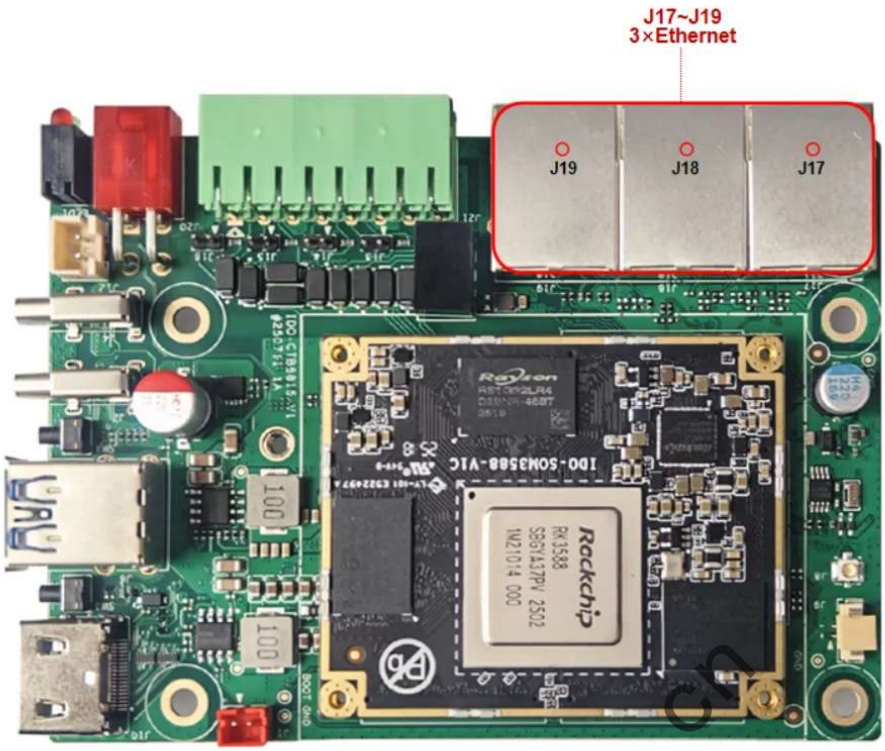


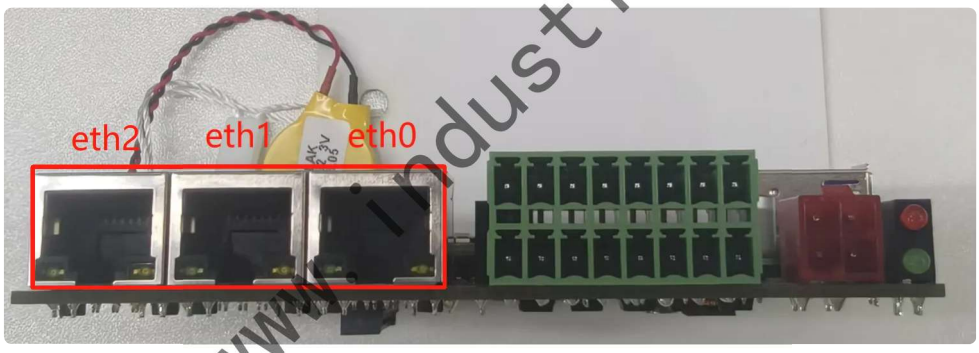
3.1.3. ssh

ssh root@ipaddress

密码：123456

3.2. 以太网



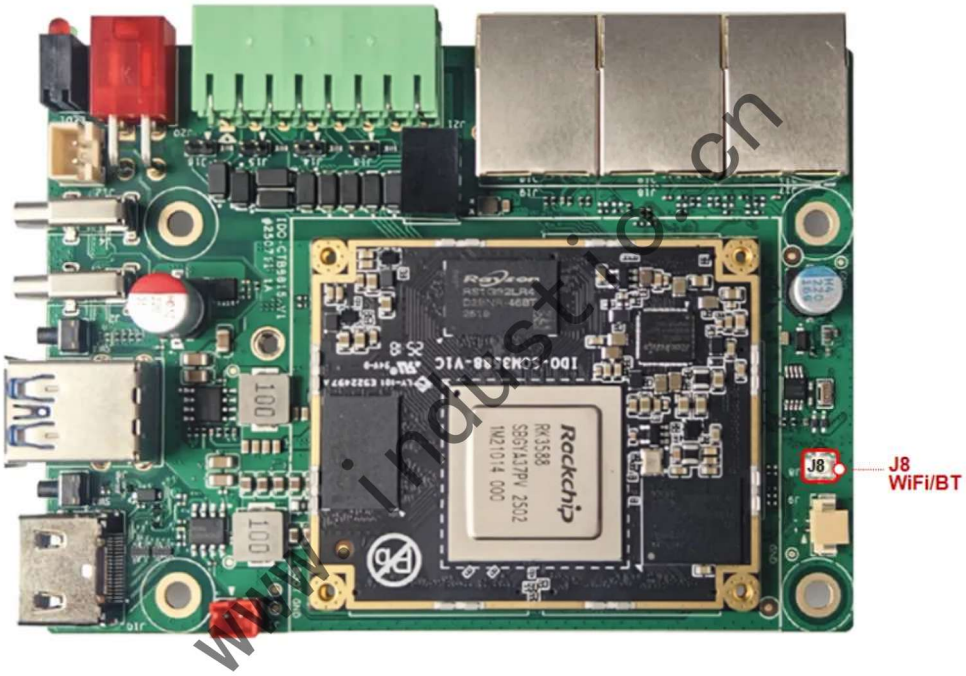


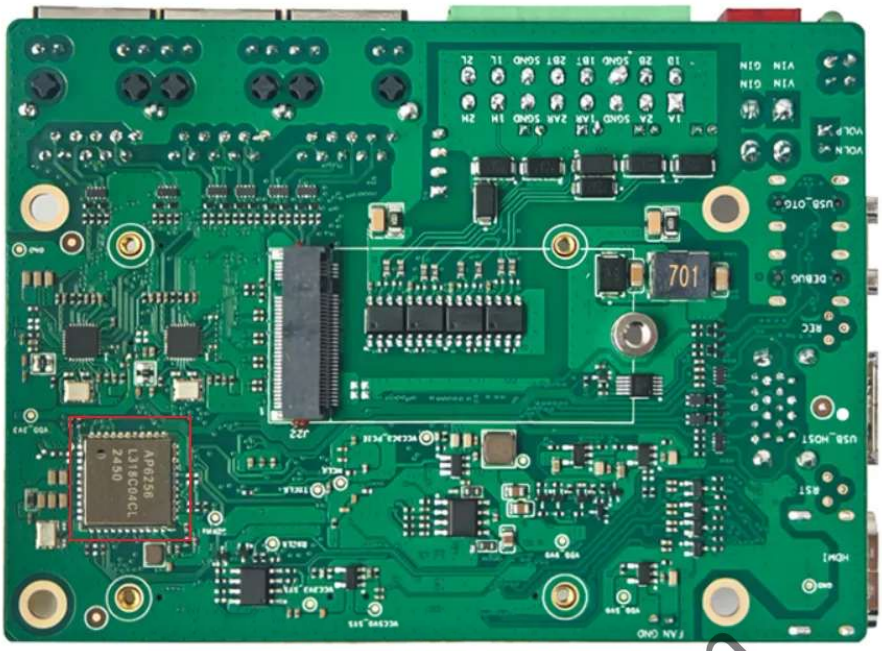
Bash

```
$ ifconfig
docker0   Link encap:Ethernet  HWaddr 02:42:01:8d:d8:8a
          inet addr:172.17.0.1  Bcast:172.17.255.255  Mask:255.255.0.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 TX bytes:0

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope: Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:240 errors:0 dropped:0 overruns:0 frame:0
          TX packets:240 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:22080 TX bytes:22080

eth0      Link encap:Ethernet  HWaddr 0a:dc:b0:80:a4:4b  Driver rk_gmac-dw
mac
          inet6 addr: fe80::8dc:b0ff:fe80:a44b/64 Scope: Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:5 errors:0 dropped:0 overruns:0 frame:0
          TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:362 TX bytes:1004
          Interrupt:71

eth1      Link encap:Ethernet  HWaddr 0e:e4:0f:db:34:72  Driver yt6801
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:2167 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2141 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:304107 TX bytes:2548456
          Interrupt:117 Base address:0x8000

eth2      Link encap:Ethernet  HWaddr 5a:a3:67:6a:96:8c  Driver yt6801
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:91 errors:0 dropped:0 overruns:0 frame:0
          TX packets:72 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:19493 TX bytes:15717
          Interrupt:127 Base address:0x4000


```

```
wlan0     Link encap:Ethernet  HWaddr 9c:b8:b4:9a:73:18  Driver bcmsdh_sdm
mc

          inet6 addr: fe80::9eb8:b4ff:fe9a:7318/64 Scope: Link
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 TX bytes:796
```

3.3. WIFIBT





3.3.1. wifi

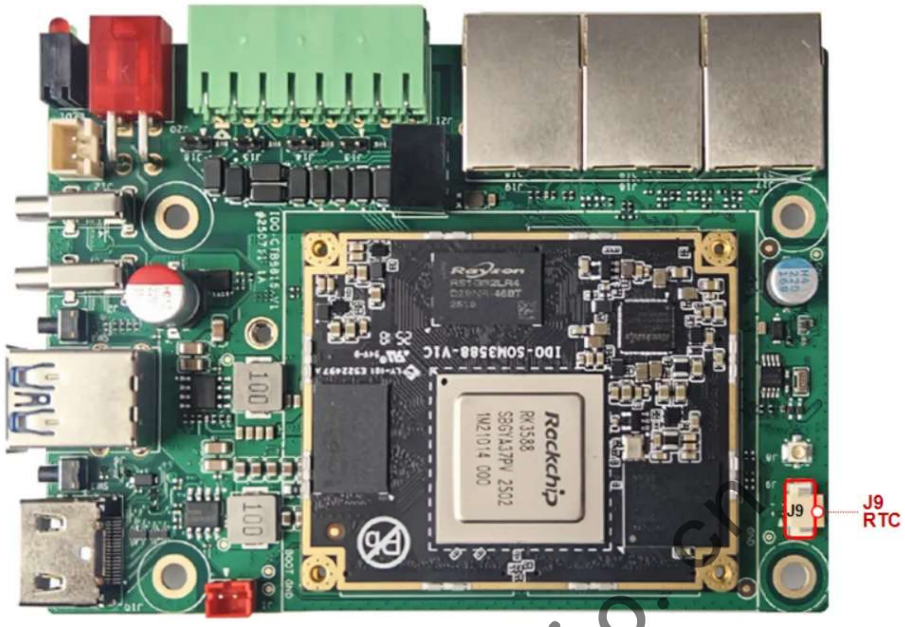
```Bash
$ nmcli dev wifi list                                    #查询wifi列表
$ nmcli dev wifi connect 账号 password 密码 ifname wlan0  #连接热点
$ nmcli connection show                                  #查看连接状态
```

3.3.2. 蓝牙

```Bash
$ bluetoothctl
[bluetooth]# bluetoothctl
[bluetooth]# power on
[bluetooth]# scan on
[bluetooth]# devices                        #查看蓝牙设备
[bluetooth]# trust AC:C4:BD:6C:F2:10        #信任设备
[bluetooth]# pair AC:C4:BD:6C:F2:10         #配对
[bluetooth]# connect AC:C4:BD:6C:F2:10      #连接
```

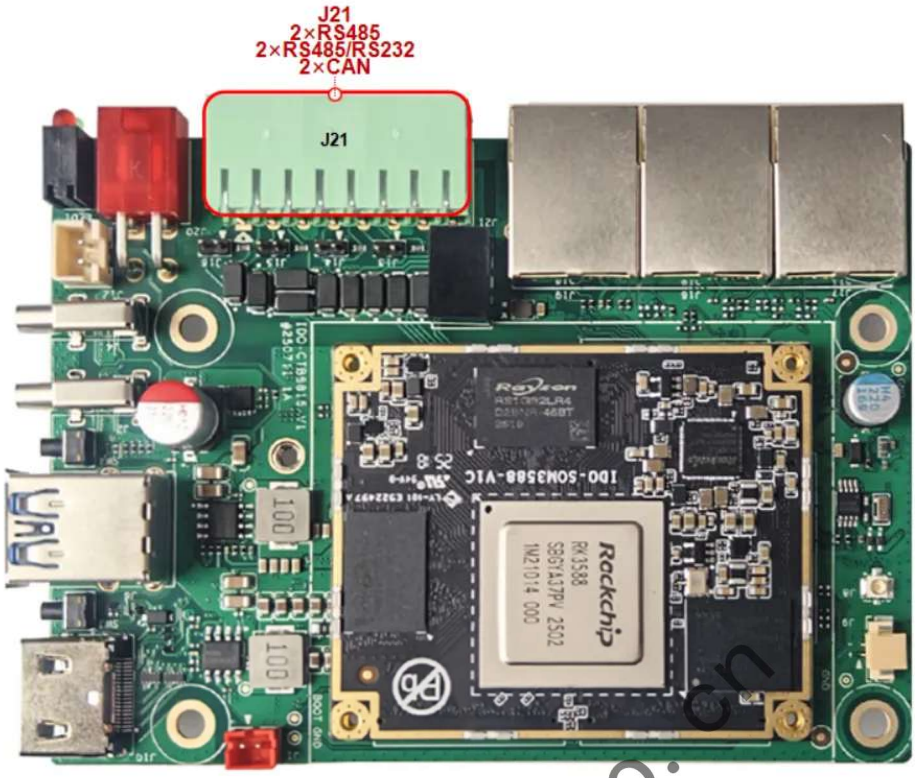
3.4. RTC

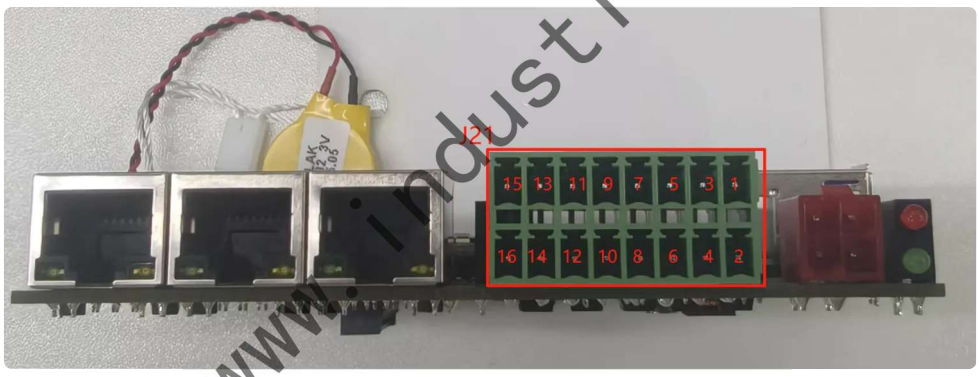
图中标注电池位置

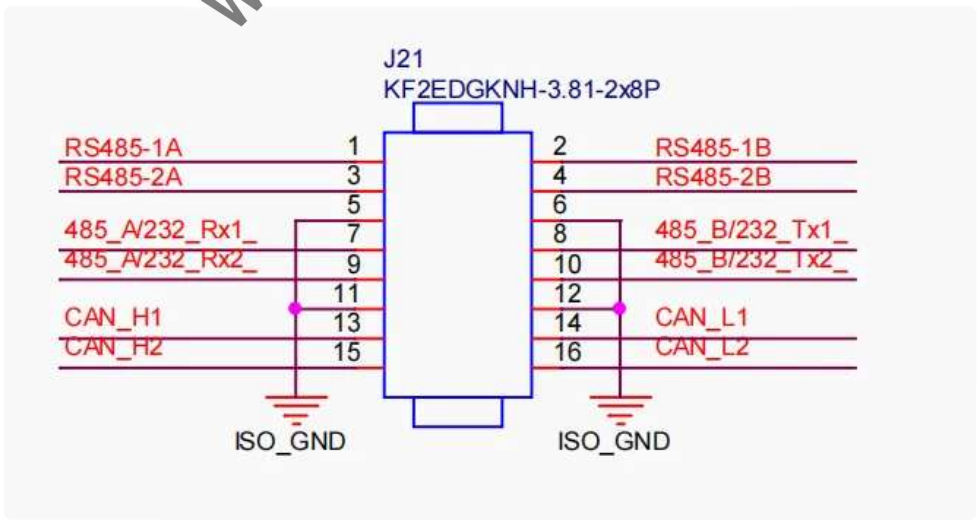



```Bash
$ date -s "2025-10-17 18:34:10"
$ hwclock -w #同步时间到RTC

$ hwclock -r
```


3.5. RS485/RS232







RS485-1		RS485-2

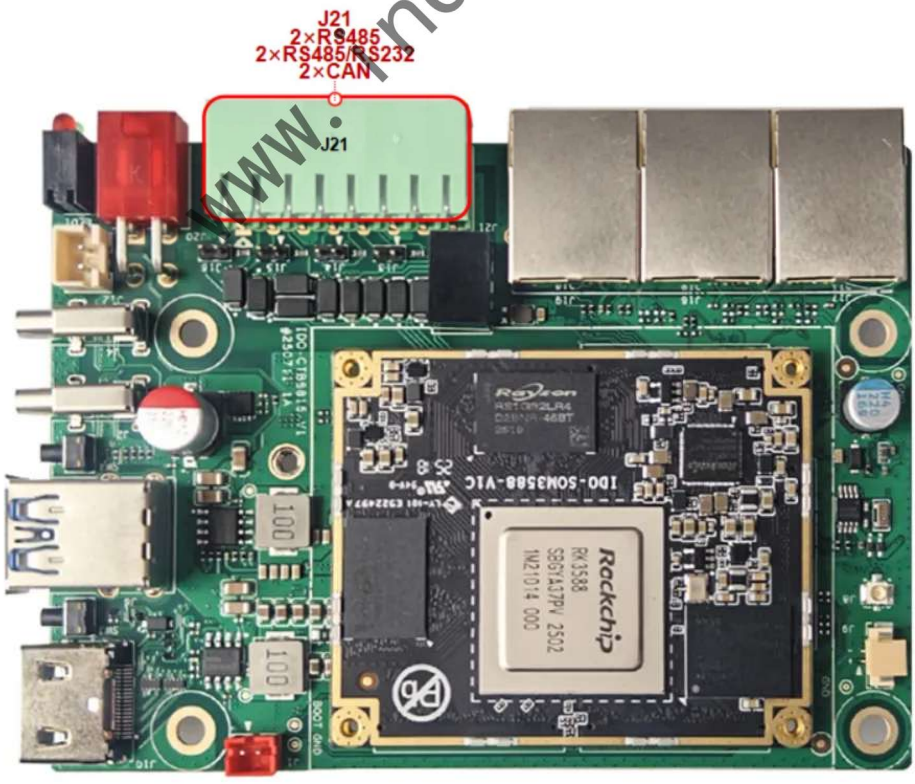
/dev/ttyS1	<---->	/dev/ttyS6
J21–1	<---->	J21–3
J21–2	<---->	J21–4

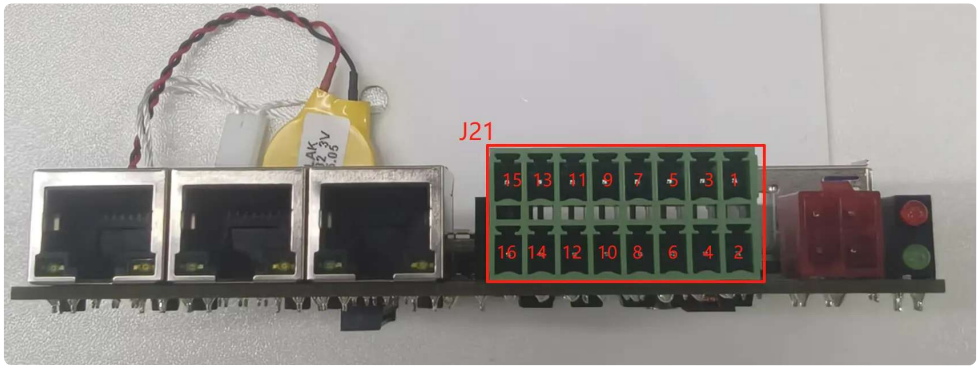
R232–1		RS232–2
/dev/ttyS3	<---->	/dev/ttyS8
J21–7	<---->	J21–10
J21–8	<---->	J21–9

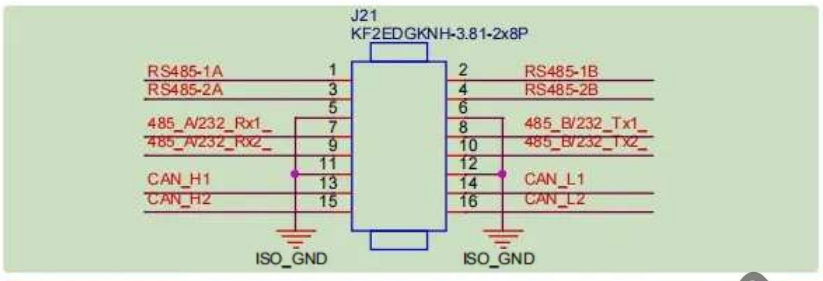
Bash

```
$ microcom -s 115200 -p /dev/ttyS1
```


3.6. CAN





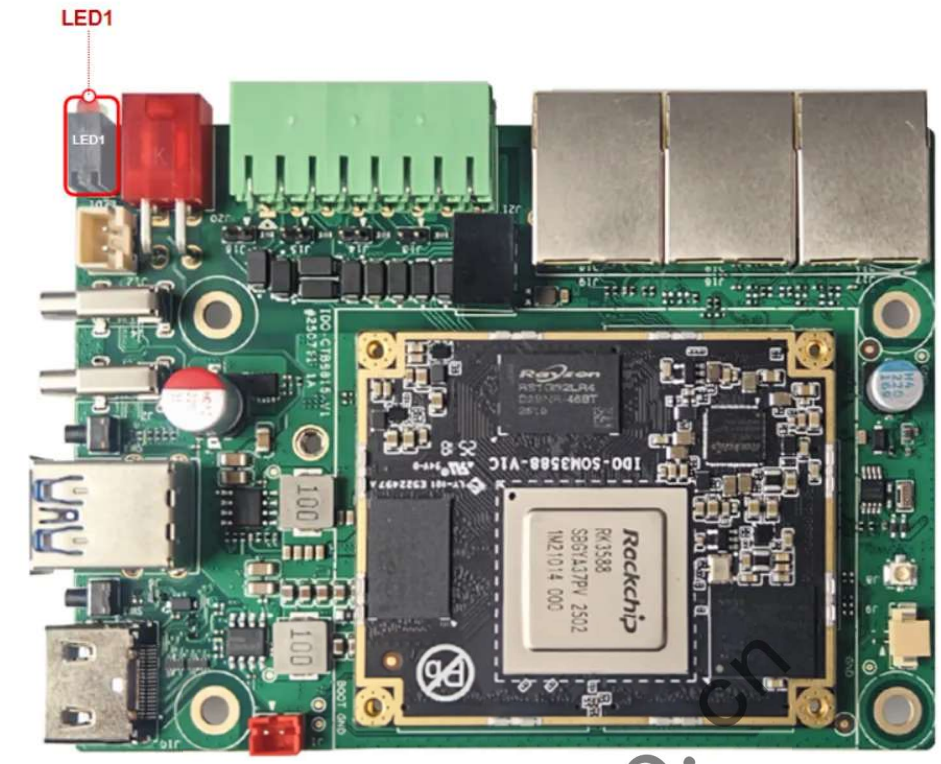


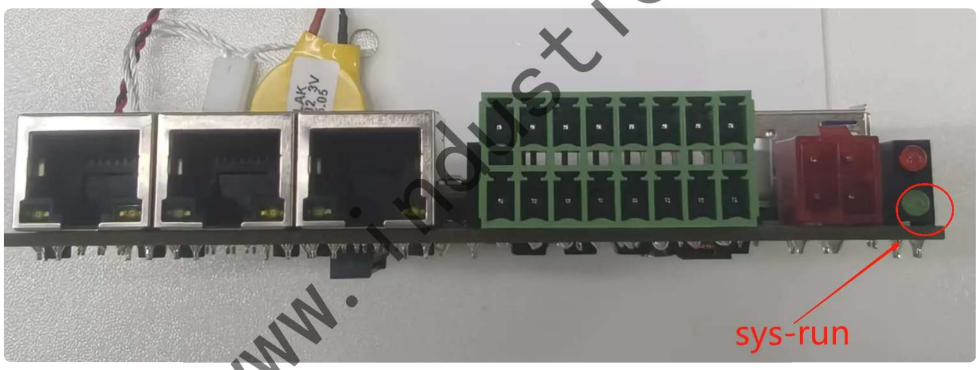
CAN0		CAN1
J21-13	<---->	J21-15
J21-14	<---->	J21-16

Bash

```
ip link set can0 type can bitrate 1000000
ip link set can0 up
ip link set can1 type can bitrate 1000000
ip link set can1 up

candump can0&                   #等待接收
cansend can1 123#DEADBEEF       #发送
```


3.7. Watchdog



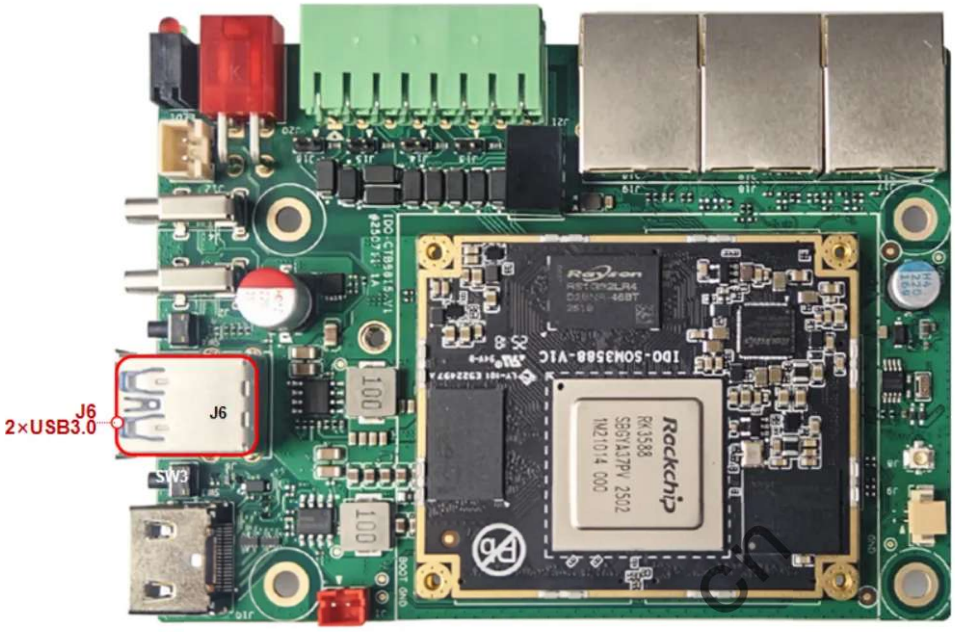


开机后进入系统后，绿灯闪烁。

测试 Bash

```
#测试需要拔掉烧录线 等待5分钟自动重启
$ cat /sys/class/leds/sys-led/trigger
none rfkill-any rfkill-none kbd-scrolllock kbd-numlock kbd-capslock kbd-kanalock kbd-shiftlock kbd-altgrlock kbd-ctrllock kbd-altlock kbd-shiftllock kbd-shiftrlock kbd-ctrlllock kbd-ctrlrlock mmc2 timer [heartbeat] backlight default-on mmc0 rfkill0 rfkill1 rfkill2 rfkill3

$ echo none > /sys/class/leds/sys-led/trigger
```

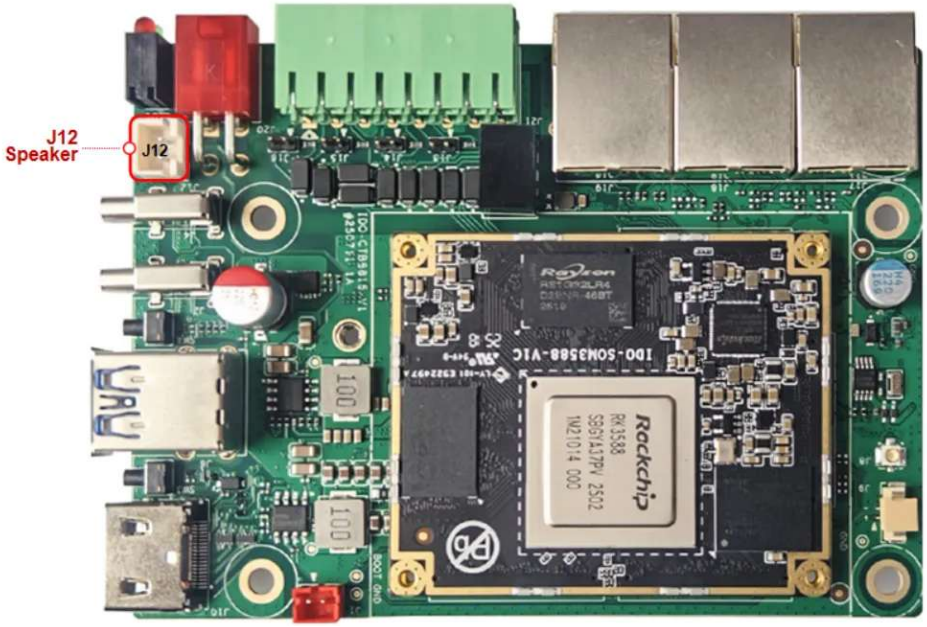
3.8. USB3.0



Bash

```
$ df -h
文件系统        容量  已用  可用 已用% 挂载点
/dev/root       114G  8.8G  105G    8% /
devtmpfs        3.9G     0  3.9G    0% /dev
tmpfs           3.9G     0  3.9G    0% /dev/shm
tmpfs           792M  4.0M  788M    1% /run
tmpfs           5.0M  4.0K  5.0M    1% /run/lock
tmpfs           3.9G     0  3.9G    0% /sys/fs/cgroup
tmpfs           3.9G  8.0K  3.9G    1% /tmp
/dev/mmcblk0p6  2.0G  292K  2.0G    1% /userdata
/dev/mmcblk0p7  124M   12M  112M   10% /oem
tmpfs           792M   24K  792M    1% /run/user/1000
/dev/sda1        30G  3.3M   30G    1% /media/industio/TU100
```

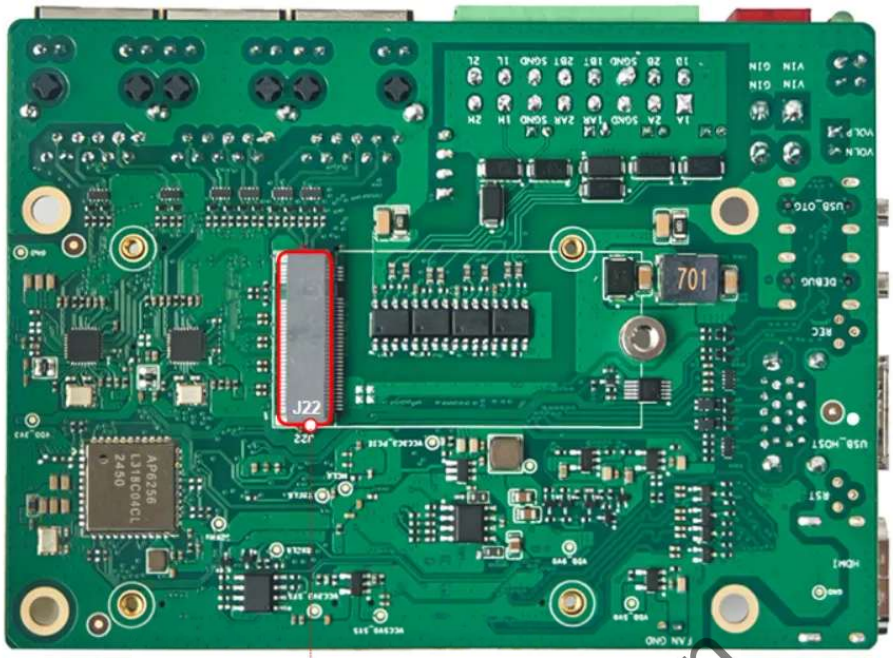

3.9. 声卡




```
$ cat /proc/asound/cards
 0 [rockchiphdmi0  ]: rockchip-hdmi0 - rockchip-hdmi0
                      rockchip-hdmi0
 1 [rockchipes8388 ]: rockchip-es8388 - rockchip-es8388
                      rockchip-es8388

#声卡
$ aplay -D hw:1,0 One_Last_Time.wav

#HDMI
$ aplay -D hw:0,0 One_Last_Time.wav
```


3.10. PCIE

使用m.2固态硬盘测试

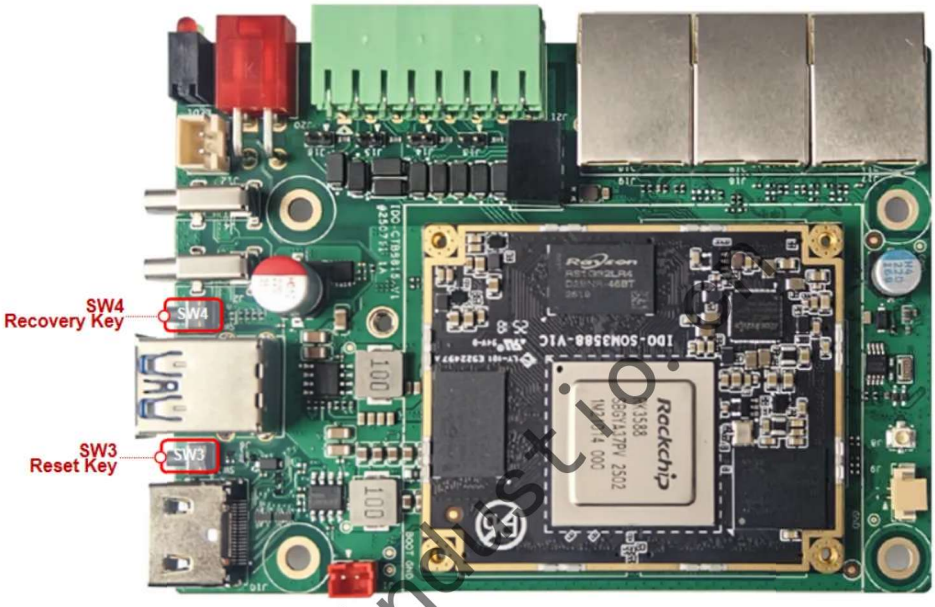


M.2 M-Key
J22

```
$ fdisk -l
Disk /dev/ram0: 4 MiB, 4194304 bytes, 8192 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes


Disk /dev/mmcblk0: 116.48 GiB, 125074145280 bytes, 244285440 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 6D3A0000-0000-4733-8000-3DFD00006CE3

Device           Start       End   Sectors   Size Type
/dev/mmcblk0p1   16384     24575      8192     4M unknown
/dev/mmcblk0p2   24576     32767      8192     4M unknown
/dev/mmcblk0p3   32768    163839    131072    64M unknown
/dev/mmcblk0p4  163840    425983    262144   128M unknown
/dev/mmcblk0p5  425984    491519     65536    32M unknown
/dev/mmcblk0p6  491520   1540095   1048576   512M unknown
/dev/mmcblk0p7 1540096   1802239    262144   128M unknown
/dev/mmcblk0p8 1802240 244285406 242483167 115.6G unknown


Disk /dev/nvme0n1: 119.24 GiB, 128035676160 bytes, 250069680 sectors
Disk model: Colorful CN600 128GB
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x92cdbbb5

Device         Boot Start       End   Sectors   Size Id Type
/dev/nvme0n1p1        63 250069679 250069617 119.2G  7 HPFS/NTFS/exFAT

root@ido:/# df -h
文件系统        容量  已用  可用 已用% 挂载点
/dev/root       114G  8.8G  105G    8% /
devtmpfs        3.9G     0  3.9G    0% /dev
tmpfs           3.9G     0  3.9G    0% /dev/shm
tmpfs           792M  4.0M  788M    1% /run
tmpfs           5.0M  4.0K  5.0M    1% /run/lock
tmpfs           3.9G     0  3.9G    0% /sys/fs/cgroup
tmpfs           3.9G  8.0K  3.9G    1% /tmp
```

```
/dev/mmcblk0p6  2.0G  292K  2.0G    1% /userdata
/dev/mmcblk0p7  124M   12M  112M   10% /oem
tmpfs           792M   24K  792M    1% /run/user/1000
/dev/nvme0n1p1 125034808 29531856  95502952  24% /mnt/m2
```

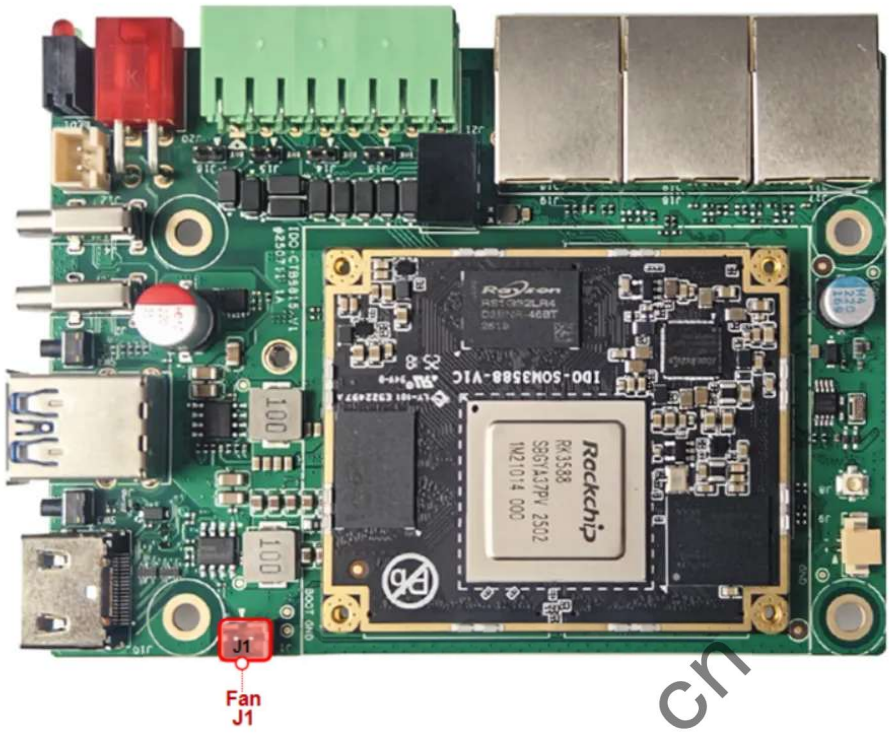
3.11. 按键



SW3：复位按键，按下松开，系统重启。

SW3	RESET
SW4	RECOVERY

3.12. FAN




```bash
##打开风扇
$ echo 1 > /sys/class/leds/fan-pwr/brightness
##关闭风扇
$ echo 0 > /sys/class/leds/fan-pwr/brightness
```


3.13. 显示

3.13.1. HDMI